headed "Levulose Sirup," which contained one statement that I believe should be corrected. He states that of the four sugar products, glucose, sorghum, honey and maltose, "sorghum and honey are the only ones that compete with sugar in sweetness," and farther on in the article adds "of the two sweeter products, honey will probably of necessity always remain a luxury." It is this last statement to which I take exception.

Honey should not be considered a luxury. It is the form of sweet that was used long before cane sugar was ever thought of, and is in many places now a staple article of food. During the sugar shortage caused by the late war honey was used to a much greater extent than ever before in this country and thousands of families used honey almost exclusively in place of sugar. In addition, millions of pounds were exported. One reason that honey is often considered a luxury is because it is too frequently bought in such small quantities that the purchaser is paying far more for the container and the labor of putting the honey up in such form than he is for the honey itself. The writer knows a number of families who buy extracted honey regularly in 60 pound lots and consider it a staple article of food rather than a luxury.

Enormous quantities of honey are used in baking in this country, both for home baking and by commercial baking firms, since honey possesses a number of advantages over sugar in baking. It is stated that the National Biscuit Company at one time bought seventy carloads of honey in one lot. Honey is also extensively used in the making of fine candies, high-grade ice cream and soft drinks.

It is a commendable thing to point out as Mr. Willaman has done, how a new industry may be developed, especially when the product of such industry is to be a food, yet it is unjust in pointing out such a possibility to make a statement which tends to foster a mistaken idea, entirely too prevalent already, about another food product, an idea that the beekeeping industry and all its sponsors are trying to eradicate. The beekeeping industry in this country is annually conserving millions upon millions of pounds of one of the finest food products existent that would otherwise be absolutely lost. Yet many times the amount saved is actually lost because this industry is not developed to such an extent as to take care of more than a small percentage of the possibilities. The complete development of this industry can come only when the people as a whole recognize honey as a staple article of food rather than as a luxury.

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THE FLIGHT OF FIREFLIES AND THE FLASHING IMPULSE

FIREFLIES are wonderfully interesting creatures. There is something marvellous in the physiology of a lowly living mechanism that can transform chemical energy into luminous energy with such a nearly perfect radiant efficiency and with so little effort as do the fireflies. Theirs is a light without appreciable heating effects, because in some manner the energy of special chemical reactions taking place within their tissues, is transformed almost entirely into luminous energy.

If one observes fireflies[1] closely it will be noted that their flight movements and flashing under certain conditions bear some relation to each other. During the day these insects seek concealment in the low herbage and grass. With the approach of evening they become active and just after sundown may be seen to arise in great numbers from the damp herbage, flashing leisurely from time to time. If the air is still and warm, it will be noted that as the creatures arise very slowly, each flash is attended by a sudden upward flight impulse which may even carry them almost straight upward several feet. Usually, however, they are propelled upward in a more or less curved path.

At this time the flight of the fireflies appears to be very weak, for they drift along aimlessly, and appear almost unable to keep clear of the herbage, often actually descending

[1] These observations apply to the behavior of the species *Photinus pyralis* Linn.

as if to alight again. When it seems that they must inevitably terminate their flight and settle down upon the herbage, another flash renews and quickens the flight impulse and they arise precipitately, as if suddenly propelled upward by some energizing stimulus attending the flash.

This striking behavior may be observed almost any calm evening throughout the summer. It is particularly noticeable when the insects are arising from the herbage, and are just preparing to get fairly on the wing. What is the actual significance of this luminosity to the insects? In what manner does the flash stimulate momentarily the powers of upward flight? It would sometimes seem as if the energy-transformation attending the flash, actually aided them to get fairly on the wing, possibly also sustaining their flight in some manner.

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SPECIAL ARTICLES

FUNGICIDAL DUSTS FOR CONTROL OF SMUT

For more than a century efforts have been made to secure a perfect method of treating cereal seeds to destroy smut spores carried on their surfaces. Many fungicides have been tested and a number of standard formulas have been put forth as efficient. More recent investigations have demonstrated that none of the formulas involving dipping seed in solutions, fumigating with powerful gases or dissolving spores by various solvents, has proven completely successful. Reagents of sufficient strength to destroy the smut spores have proven to be injurious to the germination of the seed.

It has been demonstrated recently by the writers and by many other investigators, that the commonly accepted standard smut fungical formulas involving the use of bluestone and of formaldehyde, are frequently extremely injurious to the germination of the seed and the development of the seedlings. In arid and semi-arid wheat areas, formaldehyde frequently causes serious losses in seed planted in dry soil. Bluestone, the preferred fungicide in such regions, causes serious losses in germination and delayed growth of seedlings. Threshing operations in semi-arid regions cause greater rupture to seed coats than occur in more humid regions, further increasing seed injury. To avoid these losses, it has been recommended that the bluestoned seed be dipped, after a short drain, in a lime solution to react with the copper and thus check the penetration of the copper sulphate in the seed germ as soon as it has destroyed the bunt spores adhering to the surface of seed. Unless the seed coats have been badly ruptured this formula is very effective but it has been found that the seed does not pass so freely through the drill and, in cold damp weather, the seed dries slowly due to the coating of lime and hence may cause fermentation or heating. To avoid these troubles experiments with bluestone used as a dust were undertaken. The partial success of flowers of sulphur in preventing bunt in California and the reported success with copper carbonate by the Department of Agriculture of New South Wales, gave encouragement for attempting dust treatments.

Little Club wheat dusted with spores of bunt (*Tilletia tritici*) at the rate of 1 part of spores to 750 parts of seed by weight and treated according to standard formulas, gave the following results:

Fungicide	Treatment		Smutted Plants %	Smutted Heads %
	Strength	Germination %		
Check	—	99.0	12.8	6.2
Formaldehyde	1–40	98.0	0.	0.
Copper sulphate	1–4	12.5	0.	0.
Copper sulphate + lime solution	1–4 1–8	80.0	1.7	.4
Copper carbonate	dust	95.3	0.	0.
Copper sulphate	dust	54.1	0.	0.
Copper sulphate dust mixed with calcium carbonate dust (1–1)	dust	98.3	0.	0.
Copper sulphate and lime dusted separately	dust	96.5	0.	0.

Rod row plantings were made March 8, 1920, and later, which accounts for the rather